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"How To Handle Real-Life Well Production Instabilities And Uncertainties Within "Digital Fields" A Practical Application From Congo And Gabon

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Abstract

Digital fields involve the regular use of modeling tools to model and optimize production systems. Modeling is a challenge given the transient and instable flow regimes encountered in Oil & Gas facilities. Optimization requires a further level of accuracy: it implies the modeling of an envelope of production operating-points.

This paper presents the solutions which are being implemented in two affiliates of West Africa within TOTAL Digital Field corporate program called Field Monitoring, to address this issue.

The instabilities of production parameters observed during production tests are assessed for gas-lifted wells in Total Congo and Gabon affiliates. These tests are systematically modeled with nodal well flow models. The impact of well instabilities or metering and reservoir uncertainties on modeled outputs such as gross production rates is assessed.

This enables to better check the quality of production tests or the need to question or update the model of a well.

This study highlights the parameters which have the main influence on well models outputs. It shows the accuracy of these models which can also be used to carry out virtual flow metering.

It provides guidelines on how to keep well flow models updated, which is a key issue to sustain real-time production optimization tools.

The conclusions of this study are now implemented in TOTAL Congo and Gabon affiliates as a positive part of the change management involved in Digital Fields implementations to monitor and optimize the performance of production wells.

Introduction

To address the challenge of production optimization on a daily or even real time frequency, many oil companies are strongly

involved in the development of Digital Fields technology. Total is one of them. It has developed a fit-for-purpose tool which was installed as a pilot on the mature field in Congo (**ref. 1**). This tool called "WPM" standing for Well Performance Monitoring is being industrialized and deployed at a corporate level.

This tool is providing data visualization tools, a first-class alarming system. Some of these alarms are based on modeling by well flow model PROSPER.

One of the workflow is the automatic modeling of production test. **Figure 1** is showing its logigram; WPM detects automatically new production tests in the corporate Production Database Management System (noted PDMS). Downloading the averaged results of the tests from PDMS, and from the Reservoir Database (the OFM software) the reservoir static pressure and the productivity index of the well, WPM models the test with PROSPER using two computation techniques, "System Calculation" and "Quick-Look" described in the following paragraphs.

For each OUTPUT, the difference between the modeled data and the actual average test data is computed. As soon as this difference is greater than a specified cut-off, an alarm is triggered.

On a theoretical point of view, this approach implies implicitly that well flow models are linear, which is not true: the OUTPUTs computed with the averages of the INPUTs are not equal to the average of the OUTPUTs which would be computed with real-time data INPUTs.

On a practical point of view, this approach requires to define the limits which trigger the alarms: what is the acceptable error between a model and reality? These cut-offs have to fulfill opposite targets:

- be low enough to ensure that all the well models are sufficiently accurate to enable a reliable gas-lift allocation and production optimization,